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Editorial.—The Monthly Index, published at 10 Spruce St., New York, is an exceedingly convenient publication. In it we have each month a complete classified list of the periodical literature of every department of thought, except fiction. Looking under the appropriate heading a botanist can find all that has been published the previous month relating to his own science, and can thus procure whatever is of special interest.

Sir John Lubbock, in his inaugural address as presiding officer of the recent meeting of the British Association, made the following remarks in illustration of the progress of the Science of Botany in the last half century: "Some of the most fascinating branches of botany—morphology, histology, and physiology—scarcely existed before 1830. In the two former branches the discoveries of von Mohl are pre-eminent. He first observed cell-division in 1835, and detected the presence of starch in chlorophyll-corpuscles in 1837, while he first described protoplasm, now so familiar to us, at least by name, in 1846. In the same year Amici discovered the existence of the embryonic vesicle in the embryo-sac. The existence of sexual reproduction in the lower plants was doubtful, or at least doubted by some eminent authorities, as recently as 1853, when the actual process of fertilization in the common bladderwrack of our shores was observed by Thuret, while the reproduction of the larger fungi was first worked out by de Bary in 1863. As regards lichens, Schwendener proposed, in 1869, the startling theory, now however accepted by some of the highest authorities, that lichens are not autonomous organisms, but commensal associations of a fungus parasitic on an alga. With reference to the higher Cryptogams it is hardly too much to say that the whole of our exact knowledge of their life history has been obtained during the last half century. Thus in the case of the ferns the male organs, or antheridia, were first discovered by Nageli in 1844, and the archegonia, or female organs, by Suminski, in 1848. The early stages in the development of the mosses were worked out by Valentine in 1833. Lastly, the principle of alternations of generations in plants was discovered by Hofmeister. This eminent naturalist also, in 1851–4, pointed out the homologies of the reproductive processes in mosses, vascular cryptogams, gymnosperms and angiosperms.

Baron Ferd. von Mueller has sent to Kew Gardens a living specimen of his recently described Australian Cycad, *Macrozamia Moorei*. The stem sent is four feet high, five and a half feet in circumference, and weighs six hundred pounds. Specimens have been seen twenty feet high and six feet four inches in circumference, with

cones two to three feet long, and leaves seven feet long. For a Cycad this is most remarkable.

M. PLANCHON reports a new species of *Cissus* from the interior of Sierra Leone, capable of bearing the winter of Marseilles. Its endurance is a matter of temperament, and a proof of the extent of the scale of resistance to cold and heat which some plants possess, and which often upsets all prevision.

THE JOURNAL OF BOTANY for September gives quite a full account of the life and character of the late Mr. H. C. Watson, the eminent English botanical geographer, who died the 27th of July. The article is accompanied by an excellent portrait.

MR. G. S. JENMAN has described a new tree fern from Jamaica, which he calls *Cyathea monstrabilia*. Its trunk is four or more feet high and three inches in diameter, while the fronds are three or four feet long and 15–20 inches wide.

MR. HENRY M. DOUGLASS, of Richland, N. Y., is publishing a translation of the *Botanische Zeitung* which he calls the *Botanical News*. The subscription price is fixed at $2.50 per year.

MR. L. F. HENNEGUY confirms the observations of Brant that an aqueous solution of aniline brown, known in commerce as Bismarck brown, will give an intense brownish-yellow color to the protoplasm of the infusoria without in any way interfering with their enjoyment of life. The coloration first appears in the vacuoles of the protoplasm, then this latter is itself stained, the nucleus being most generally not at first colored, and so being made more conspicuous. Experiments made on vegetable protoplasm seemed to exhibit the same result.

PROF. E. S. BASTIN, of Chicago, has found near Lake Michigan a most curious form of *Cypripedium spectabile*. A single stem bears two flowers, one normal and the other almost regular. This "monster" had three distinct and equal sepals; three nearly equal petals, shaped like the sepals, but narrower, and with no trace of a "slipper;" ovary not at all twisted; three distinct anthers instead of two; three-lobed stigma. Instead of the triangular fleshy body, heretofore supposed to represent the third stamen, there were two of these bodies alternating with the petals, and if representing stamens at all, they must be an outer whorl. Of course two whorls of stamens are just what we want, for they are more typical than one. This *Cypripedium* seemed to have taken a long stride backwards towards some of its ancestral forms that were regular.

THE SUMMER SCHOOL OF BOTANY in the University of Minnesota, seems to have been a success, about forty teachers having enrolled themselves. Prof. Bessey gives the outline of his laboratory course as follows: I. *General Histology of Plants.*—Protoplasm in hairs and tissues, cells, cell walls and their markings, chlorophyll, starch, plant crystals, parenchyma, collenchyma, sclerenchyma, fibrous tissue, laticiferous tissue, sieve tissue, tracheary tissue, epidermis, stomata, hairs, fibro-vascular bundles. II. *The Structure and Physiology of Cryptogmas.*—(1) The Sexless Plants (Protophyta), Protococcus, Nostoc, Oscillatoria, Rivularia, yeast plant, Bacteria; (2) The Unisexual Plants (Zygosporeæ), Hydrodictyon, Conferva, Desmids, Diatoms, Spirogy-

ra, Mucor; (3) The Egg-spore Plants (Oosporeæ), Œdogonium, Vaucheria, Peronospora, Cystopus, Fucus; (4) The Red Seaweeds and their allies (Carposporeæ), Podosphæra, Eurotium, Parmelia, Puccinia, Agaricus; (5) The Mosses and their allies (Bryophyta), Marchantia, Mnium; (6) The Ferns and their allies (Pteridophyta), fern prothallia and fruiting, Pteris, Polypodium, Selaginella. III. *The Structure and Physiology of Phanerogams.*—The structure of Gymnosperms; the sexual reproduction of Monocotyledons; the sexual reproduction of Dicotyledons.

Notes.—Those who have had the pleasure of seeing that lovely tree, the *Magnolia grandiflora*, in bloom in its native haunts, and who live north of Maryland, must have ceaseless regret that it is not generally hardy in their district. A few trees live and bloom in sheltered situations above the state mentioned. A single specimen in this city (Wilmington, Delaware) blooms freely nearly every year. Through the kindness of the owner, J. H. Jackson, Esq., I am enabled to give the following record of the period of its flowering for the years mentioned. The dates given are of the first and last flowers and show the *period* of flowering to be much longer than might be supposed; of course much the greater number of flowers appear during the first four weeks.

1873, from June 20 to _____.
1874, " June 22 to August 19.
1875, " June 21 to August 5.
1876, " June 11 to August 10.
1877, " June 11 to August 1.
1878, " May 30 to August 22.
1879, " June 9 to August 17.
1880, " May 28 to _____.

1881, tree survived the excessive cold of last winter and bloomed, but less freely than usual. No record has been kept since the last date mentioned.

THE PENINSULA between Delaware and Chesapeake bays has generally a light, rather thin sandy soil, which does not differ materially from that mostly prevalent in the Atlantic coast region from Long Island southward. Yet it produces some noble forests of both evergreen and deciduous trees. Some of your readers may remember the splendid specimens of black walnut and tulip trees, shown at the Centennial Exhibition by the Delaware State Commission. These were respectively 7 and 9 feet through and were perfectly sound and solid. While in Southern Delaware, some months since, I measured a Cypress (*Taxodium*) stump, 9 feet across. A Post Oak (*Quercus stellata*) measured 16 feet in circumference at 3 feet from the ground. *Pinus Tæda* and *Pinus mitis* attain a height of 100 feet and a girth of 10 to 14 feet. Even *Pinus inops* which is usually considered a low and straggling tree, was seen at least 60 feet in height. Some specimens of *Alnus maritima* (a species perhaps exclusively found in this district) may well rank as trees. Here are measurements of three individuals.

No. 1, 25 feet high, 13 inches in circumference near base.
No. 2, 32 feet 8 inches high, 13 inches " "
No. 3, 31 " 1 inch " 16 " " "

THE MISTLETOE is frequent in this region and always, so far as I have observed, found on *Nyssa multiflora* or *Acer rubrum*. In last September it was seen in fine fruit and also in full flower. The books which I can consult, give the flowering period as April or May. This, I believe, is correct in the far south. Can it be. that in more northern localities it flowers in the fall and perfects its fruit the next year, as is the case with *Hamamelis* and *Alnus maritima?* I should be glad to have information upon this point.—WM. M. CANBY.

Calamagrostis Howellii, n. sp.—Culms densely tufted, 10-20 inches high, erect, or somewhat geniculate below, smooth; radical leaves loosely setaceous involute, firm but not rigid, in length nearly equalling or even exceeding the culm, ligule conspicuous, about 1½ lines long, scarious, culm leaves about 3, narrow or filiform, 4 to 8 inches long, the upper one equalling the culm; panicle pyramidal, 2 to 4 inches long, loose and spreading, rays mostly in fives, lower ones 1 to 1½ inches long, numerously flowered above the middle; spikelets pale green or purple tinged, outer glumes lanceolate, acute, 2½ to 3 lines long, nearly equal, membranaceous, 1-nerved or the upper indistinctly 3-nerved, flowering glume slightly shorter than the outer ones, ovate-lanceolate, acute, 4-nerved above, the apex with 2 mucronate pointed teeth, the conspicuous strong awn inserted about the lower third, half an inch long, palet rather shorter than its glume, bidentate at the apex, basal hairs about half as long as the flower, those of the rudiment rather longer.

A well marked and handsome species, remarkable for the long setaceous leaves, both radical and cauline, and for the open panicle and conspicuous awns. It is named for the discoverer, *T. J. Howell*, Oregon.—GEO. VASEY.

Blight.—Editors BOTANICAL GAZETTE:—Please permit me to call the attention of your readers who are adepts in the use of the compound microscope, to the subject of disease in plants by *bacteria*. Last year accounts of my own investigations were published in the transactions of the American Association for the Advancement of Science, Scientific American, American Naturalist, and elsewhere. These had special reference to the so called "fire blight" of the pear and "twig-blight" of the apple tree. Some much more limited studies upon the "yellows" of the peach were also published in "Science." The proofs offered in these accounts were such as:—

1. The uniform presence of a certain species of *Bacterium* in the dying tissues.

2. The appearance of the disease upon inoculating healthy limbs with this *Bacterium*.

3. The observed multiplication of the organism and the gradual spread of the disease from the point of inoculation.

The results fully convinced me that these diseases of our orchard trees are directly due to the operations of this minute cryptogamic

plant, whatever may be the indirect surroundings and conditions rendering such operations possible. The experiments of last year have been repeated and verified during the present season (1881), and further research has shown that fruit trees are in no wise peculiar in this respect. Many other plants suffer in a similar manner from the same cause. Among trees, none are more certainly and surely destroyed in this way than the Lombardy poplar, whose dead or dying spires so commonly attract the attention of the most casual observers throughout our land. *Populus tremuloides* dies still more apparently like the pear tree. The butternut and the linden succumb to the same destroyer. Ash and elm trees do not fully escape; the maples, especially the "sugar tree," often similarly suffer. Shrubs and herbaceous plants are also injured or killed outright by the avaricious, omnivorous little creatures. The leaves of the white flowered lilac wither upon their stems before they have half filled their proper duties, and those of the common pæony die while the summer's sun invites them to fuller development and activity.

In these and many other instances, the destroying agent is almost surely one and the same, though the appearance and even characteristics differ very much in the resulting effects upon different subjects. The pear tree more commonly becomes diseased throughout the entire stem and its appendages, while the young twigs of the apple-tree often alone perish or a limited area of the bark upon the trunk dies. In the lilac it is the leaves which suffer, the branchlets bearing them continuing in perfect health. In the case of the Lombardy poplar the small limbs perish only because the larger parts are destroyed. So far as I have observed, the leaves are not at all infected. If the yellows of the peach is really due to the same specific *Bacterium*, a still further difference is shown, for this tree does not die by inches, the disease beginning in some well-defined place, and gradually spreading, as in the other cases. The whole top languishes, and it has been supposed that the roots were also involved. My studies upon this disease have been confined to severed specimens sent to me through the mail, but in no instance have I found the pieces of roots taken from diseased trees infected with bacteria; the diseased limbs always are. In the pear, apple, poplar, etc., the roots are *never* the seat of the disease, and become infected, if at all, only through the contagion from the trunk.

Inoculations with fresh material (bacteria) are as certain to communicate the disease as are similar operations upon animals. Vaccination as practiced against small-pox is not successful in a greater number of instances than is this method of producing blight. In last year's experiments sixty-three per cent. of the total number of inoculations in pear and apple unmistakably communicated the disease. By operating on what became known as the most susceptible parts and kinds, a much greater per cent. succeeded, approaching near to one hundred. Similar punctures with a clean needle had no effect whatever. Application to the outside of the unbroken epidermis was ineffectual. These results are corroborated by similar experiments this year, not however prosecuted to the same extent.

There are to my mind many interesting questions left unsolved,

but the main proposition is, it seems to me, as thoroughly demonstrated as any physiological or pathological matter can be. There are no speculations or unfounded theories admitted; experiments, observations and results. I should be pleased to know if others have tried such experiments.—T. J. BURRILL.

Forest Notes.—While on a recent trip in the Boston Mountains, I found *Acer rubrum* growing several hundred feet above the drainage of the surrounding country on sandy, dry ridges. It surprised me because I had never found this species growing in the river bottoms of this region where *Acer dasycarpum* is quite common.

I had always thought that *Acer rubrum* was confined to the low country. I found *A. saccharinum* growing in the same situations.

Carya myristicæformis was found, for the first time in this State, last summer, in the Red River bottom above Fulton, and this summer, it was observed in great abundance in South-Eastern Arkansas, from about Pine Bluff almost to the south boundary, growing with *Carya aquatica* in low situations. The nut of this species is about the size of a pecan, and is edible. It is called swamp hickory by the natives, and in some localities "conscript hickory-nut," by the darkies.

Planera aquatica is distributed throughout Eastern and Southern Arkansas.

Quercus Michauxii is the principal species of the white oaks found in South-Eastern Arkansas. It assumes majestic proportions, some specimens having a diameter of 19 feet.

A specimen of *Euonymus atropurpureus*, 7 inches in diameter, and 30 feet high, was observed in the vicinity of Little Rock. The tree was full of fruit, and the identification thus made easy and certain.

We were surprised by not seeing any of the *Magnolias* in South-Eastern Arkansas, as we had expected to find several species.

Pinus Tæda grows in Arkansas as far north as Little Rock. This species and *P. mitis* are the members of this genus we have found in the State.—F. L. HARVEY, *Fayetteville, Ark.*

Hieracium aurantiacum.—Mr. Meehan on page 265 of the current number of the Gazette, in speaking of *Hieracium aurantiacum L.* (*Crepis*), desires that stations may be recorded. In volume V. of the Bulletin of the Torrey Botanical Club, page 32, I recorded its first appearance in this State. This was in 1874. Since then I have observed it every year, but have not seen in it any decided tendency to increase. As it is proliferous at the base, it would seem well calculated to spread. It has been found by Mr. Arnold Green, Mr. Thomas Battey and myself at various points in this State. I have a location for it here in the city of Providence, in one corner only of a hayfield, from which it has extended into the street. The lot, although nominally in the city, is in effect far removed from the town proper. It is always possible to collect here a number of plants, and I usually keep a stock for distribution.—W. WHITMAN BAILEY.

Andropogon and Amarantaceæ.—As you correctly remark, it looks queer to see the genus *Andropogon* among the *Amarantaceæ*, as

well as among the grasses (see page 267). It may save some misapprehension of Dr. Mueller's own work to add that this is evidently one of those sins not unusually committed by printers in the make up of pages, and which so often leads authors to pray heartily that the printer may be forgiven. This is apparent from other errors on the same page, *Andropogon* being wedged in between different species of *Ptilotus*, and some species of *Gomphrena* being placed both above and below *Ptilotus*, instead of all in one sequence as they should be.—THOS. MEEHAN.

Notes from Dayton.—CONOBEA MULTIFIDA.—In your catalogue of Indiana plants, I notice the remark, "leaves in threes." I have collected this plant in Ohio, Indiana and Illinois, and have generally found the leaves arranged ternately, although occasionally the binate type was also found.

NESÆA VERTICILLATA.—Besides finding the leaves opposite and whorled, I have also seen them arranged alternately. The quarnate arrangement of leaves is frequently seen in whorls close to the ground. The ternate, in whorls subtending the flower clusters; the binate, on non-flowering branches; and the alternate, in the last shoots of the season.—AUGUST F. FOERSTE.

New Species of Fungi, by Charles H. Peck.—POLYPORUS ABORTIVUS.—Pileus small, plane or centrally depressed, often deformed or wanting, whitish or alutaceous, the superior stratum soft and spongy, composed of a compact tomentum, the inferior firm, subcorky, continuous with the central substance of the stem; pores small, unequal, decurrent, whitish, with thin dentate or lacerated dissepiments; stems central, irregular, sometimes short or obsolete, centrally firm, externally soft, spongy-tomentose; spores globose or broadly obovate, .0002—.0003 of an inch long, generally containing a single large nucleus.

"Ground under an elm tree." Illinois. *J. Wolf.* Communicated by *Prof. S. A. Forbes.*

Var. *subglobosus.* Plant consisting of a depressed or subglobose mass, having the stem very short or obsolete, the central substance marked by concentric zones and the surface everywhere porous.

"Bark of an old hickory log." Mt. Carmel, Illinois. *J. Schneck, M. D.*

This curious Polyporus appears to belong to the section MESOPUS, Division Spongiosa, and to be related to *P. biennis.* The specimens sent me are scarcely more than an inch or an inch and a half in diameter, and none of them seem to be well developed, although affording spores in great abundance. More specimens are desirable.

TRAMETES PECKII *Kalchbrenner in litt.*—"Pileo suberoso, dimidiato, sessili, subdecurrente, hirsuto, azono, ferrugineo-fusco, demum expallente, margine acuto; poris majusculis, rotundato angulatis, pileo subconcoloribus vel senio fuscescentibus; substantia lignei coloris.

A priore (An American form of *Trametes Trogii* B.) abunde differt hirsutie longiore, minus scabra, poris multo majoribus, obscurioribus, etc."

Pileus corky, dimidiate, sessile, subdecurrent, hairy, zoneless, brownish-ferruginous, becoming pale, the margin acute; pores rather large, varying from rotund to angular, colored nearly like the pileus or when old becoming brown; substance wood-color.

Dead trunks of cottonwood trees, *Populus monilifera, P. angulata*, etc., Dakota. *C. W. Irish.*

PHYLLOSTICTA ASTRAGALI.—Spots none or indefinite; perithecia numerous, often occupying both surfaces of the leaf, .007–.011 of an inch in diameter, rupturing the epidermis and partly covered by it, black, opening by a minute circular aperture; spores oblong or oblong-fusiform, colorless, .0005—.00065 of an inch long, .00012 broad.

Living, languishing or dead leaves of species of Astragalus. Canada. *Prof. J. Macoun.*

The fungus appears to kill the leaves. The spores sometimes have a faint semblance of a central transverse septum, which is apparently produced by the retraction of the endochrome toward each end.

MELANCONIUM TYPHÆ.—Nucleus very minute, dot like or narrowly elliptical, at first covered by the epidermis which at length ruptures either irregularly or longitudinally; spores oblong-fusiform, black, .0004—.0005 of an inch long, .00016 broad, somewhat persistently attached to their sporophores.

Dead leaves of *Typha angustifolia*. Charlotte, Vermont. June. *C. G. Pringle.*

This fungus is somewhat anomalous both in its minute size and in the persistent attachment of the spores to their sporophores, yet it appears to belong to the genus to which it is here referred.

ÆCIDIUM POLYGALINUM.—Spots yellowish, indefinite, sometimes occupying the whole leaf; peridia hypophyllous, crowded or scattered, short, the margin crenulate lacerate; spores subglobose, .0008—.0011 of an inch long.

Living or languishing leaves of *Polygala Senega*. Ann Arbor, Michigan. *Prof. V. N. Spaulding.*

The Æcidium in our specimens is associated with *Septoria consocia*. The spores are whitish, but probably in the fresh specimens they are yellow or orange.

ÆCIDIUM XANTHOXYLI.—Spots suborbicular, greenish-yellow; peridia short, hypophyllous, crowded; spores subglobose, .0009—.001 of an inch in diameter.

Living leaves and petioles of prickly ash, *Xanthoxylum Americanum*. Iowa. *E. W. Holway.*

The spores in the dried specimens are whitish, but they are probably yellow or orange in the fresh state.

PUCCINIA PRINGLEI.—Spots small, numerous, suborbicular, purplish on the lower surface of the leaf, concealed by the sori on the upper surface; sori epiphyllous, rarely hypophyllous, large, rather compact, occupying the whole spot, blackish-brown; spores oblong or subelliptical, slightly constricted at the septum, obtuse or subacute,

usually pale at the apex, verruculose, .0016–.002 of an inch long .0008–.0009 broad; pedicel colorless, generally about half as long as the spore.

Living leaves of *Viburnum pacuiflorum*. Canada. Aug. *C. G. Pringle.*

The spots are from one-half to one line broad. Each spot is generally occupied by a single sorus. Rarely a few sori appear along the principal veins on the lower surface of the leaf. The verrucæ or warts are irregularly scattered, but sometimes they manifest a tendency to a linear or longitudinal arrangement, and they are generally more numerous toward the apex of the spore. This is an interesting addition to the few species of Puccinia that inhabit the leaves of trees or shrubs. It is respectfully dedicated to its discoverer.

PUCCINIA HYSTERIIFORMIS.—Spots obsolete; sori scattered, rather large, oblong, at first covered by the epidermis which is at length ruptured longitudinally, black; spores oblong or oblong-clavate, blunt or pointed, strongly constricted at the septum, .0016—.0019 of an inch long, about .0008 broad; pedicel generally longer than the spore.

Living leaves of *Arenaria verna*. Utah. May. *Prof. M. E. Jones.*

The oblong sori and longitudinally ruptured epidermis present an appearance not unlike that of some species of Hysterium and suggest the specific name.

TRICHOBASIS BALSAMORHIZÆ.—Spots indefinite, brownish; sori scattered, sometimes confluent, amphigenous, reddish-brown; spores globose or subglobose, minutely rough; .0011–.0012 of an inch long, often containing one to three nuclei; pedicel nearly equal to the spore in length, soon deciduous.

Living leaves of *Balsamorhiza macrophylla*. Utah. May. *M. E. Jones.*

This will probably prove to be the stylosporiferous condition of some Puccinia or Uromyces. The large patches formed by the confluence of the sori occur mainly on or along the principal veins or midrib.

UROMYCES BOREALIS.—*Hymeniferous state.*—Spots none; peridia mostly epiphyllous, scattered or rarely collected in small clusters, short, white; spores subglobose, .00065–.0008 of an inch long.

Teleutosporiferous state.—Sori mostly epiphyllous, scattered, small, black or blackish-brown; spores obovate or subelliptical, smooth, .001–.0012 of an inch long, .0005–.00065 broad, with a prominent pale umbo at the apex; pedicel very short.

Living or languishing leaves of *Hedysarum boreale*. Canda. *C. G. Pringle.* Also on *Hedysarum Mackenzii*. *J. Macoun.*

In the dried specimens the Æcidium spores are whitish, but probably they are yellow in the fresh state. Sometimes a sorus surrounds a peridium of the Æcidium, in which case the appearance is that of a black dot with a white center.

USTILAGO OSMUNDÆ.—Spores produced in the pinnules of the fern, globose, brown, rough or verruculose, .0005–.0006 of an inch in diameter; the affected pinnules deformed, discolored, roughened and contracted into tufts.

Fronds of *Osmunda regalis*. Vermont. Aug. *C. G. Pringle.*

The loose, irregular and discolored tufts of pinnules at first sight are suggestive of the work of insects. The fungus in some instances breaks forth along the midvein of the pinnule, but generally the whole surface is roughened and defiled by it. The color of the affected pinnules varies from rusty or cinnamon brown to blackish-brown The fungus is a singular one, and but a single specimen was communicated to me. Further investigation of it is desirable.

CERCOSPORA TILIÆ.—Spots small, numerous, suborbicular, brown with a paler center; flocci tufted, hypophyllous, minute; spores bacillary, brownish or cinereous, three to five-septate, .001–.0016 of an inch long, .00015–.00016 broad.

Living leaves of *Tilia Americana*. Charlotte, Vermont. June. *C. G. Pringle.*

The center of the spots on the upper surface is sometimes tinged with reddish-brown, on the lower surface, with cinereous.

ZYGODESMUS ATRORUBER.—Flocci creeping, intricate, branched, more or less rough or granular, forming a thin effused, dark-red, tomentose stratum, spores subglobose, echinulate, .00025–.0003 of an inch long.

Decaying poplar wood. Mt. Tom, Massachusetts. November. *H. W. Harkness, M. D.*

This species is readily known by its dark vinous-red color. It is apparently allied to *Z. effusus*, a species said to be alutaceous in color.

ZYGODESMUS GRANULOSUS. — Flocci slender, smooth, much branched, forming an effused ochraceous-brown stratum, the surface of which is covered with granules; spores subglobose, echinulate, about .0003 of an inch long.

Decaying birch wood. Mt. Tom, Massachusetts. November. *H. W. Harkness.*

This is related by its granulose surface to *Z. hydnoides*, but that species is described as rubiginous or rust colored, and its spores are said to be .0006 of an inch in diameter.

Caruel's New System of Plants.—We were so interested in looking over Prof. Bessey's notice under the above caption in the last *American Naturalist*, that we take the liberty of copying it: In the last number of his *Giornale Botanico Italiano*, Caruel proposes a system of plants which contains so many interesting points that it will be profitable to reproduce it here in a condensed form. He recognizes five grand divisions, viz: Gymnogamæ, Bryogamæ, Schistogamæ, Prothallogamæ and Phanerogamæ. The first is equivalant to the Thallophyta of many German botanists, but is treated very differently by the author. The Myxomycetes are very properly placed at the lower end of the division, in a separate class, the Plasmodieæ. In accordance with the rapidly growing idea first brought out by Cohn, the chlorophyll-bearing and chlorophyll-free plants are not separated as Algæ and Fungi; and the lichens are considered an order constituting with the Sphærideæ and Gymnoascideæ the cohort Angiosporatæ, the latter very nearly equivalent to the Ascomycetes of botanists. The

radical error, as it appears to us, in Caruel's disposition of the plants of the class Thallodeæ consists in making use of the asexual reproductive bodies in characterizing the sub-classes. Conidia and zoospores at least, and almost certainly the tretraspores also (chains of four conidia ?), are homologues, whose differences are related to differences in the habitat of the plants producing them. Conidia (if we except tetraspores) are aerial, while proper zoospores are aquatic.

The position assigned to the Characeæ is scarcely a tenable one. They are too nearly related to the Floridiæ, and too distantly to the ferns to warrant placing them between the Bryogamæ and Prothallogamæ.

The separation of the Phanerogamæ into three classes will strike every one as an innovation of doubtful value. Why the orthography of Gymnospermæ should be changed to Gynospermæ, is also to be questioned. It will be observed that the cohorts and orders of the Angiospermæ rank higher respectively than do the groups bearing these names in the system most in vogue in this country: the families (omitted for want of space) in Caruel's system, are almost the equivalents of the orders of Bentham and Hooker, while Caruel's orders are nearly equivalent to Bentham and Hooker's cohorts.

Division GYMNOGAMÆ.

Class PLASMOIDEÆ.

Cohort *Plasmodiatæ*.

Order Myxomycetes; Fam. Ceratiaceæ, Trichiaceæ.

Class THALLODEÆ.

Sub-class SCHIZOSPOROPHORÆ.

Cohort *Schizosporatæ*.

Order Nostochideæ; Fam. Chroococcaceæ, Oscillariaceæ, Nostocaceæ, Rivulariaceæ, Scytonemaceæ.

Sub-class CONIDIOPHORÆ.

Cohort *Gymnosporatæ*.

Order Puccinideæ; Fam. Sporotrichaceæ, Fusariaceæ, Stilbaceæ, Trichodermaceæ Ustilaginaceæ, Pucciniaceæ.
Order Agaricideæ; Fam. Exobasidiaceæ, Tremellaceæ, Agaricaceæ, Lycoperdonaceæ.

Cohort *Angiosporatæ*.

Order Gymnoascideæ; Fam. Gymnoascaceæ.
Order Sphærideæ; Fam. Helvellaceæ, Sphæriaceæ, Erysiphaceæ, Tuberaceæ.
Order Lichenideæ; Fam. Myriangiaceæ, Verrucariaceæ, Parmeliaceæ.

Sub-class ZOOSPOROPHORÆ.

Cohort *Euzoosporatæ*.

Order Ulvideæ; Fam. Cladophoraceæ, Ulvaceæ, Sphacelariaceæ, Sporochnaceæ.

Cohort *Zygosporatæ*.

Order Pandorinideæ: Fam. Botrydiaceæ, Pandorinaceæ, Ulotrichaceæ.
Order Zygnemideæ; Fam. Diatomaceæ, Desmidiaceæ, Zygnemaceæ.
Order Peronosporideæ; Fam. Mucoraceæ, Chytridiaceæ, Peronosporaceæ, Saprolegniaceæ.

Cohort *Oosporatæ*.

Order Vaucheridеæ; Fam. Monoblepharidaceæ, Volvocaceæ, Vaucheriaceæ, Sphæropleaceæ, Œdogoniaceæ, Coleochætaceæ.
Order Fucideæ; Fam. Ectocarpaceæ, Fucaceæ.

Sub-class TETRASPOROPHORÆ.

Cohort *Tetrasporatæ*.

Order **Pseudoflorideæ**; Fam. Porphyraceæ, Dictyotaceæ.
Order **Florideæ**; Fam. Ceramiaceæ, Nemaliaceæ, Lemaneaceæ, Sphærococcaceæ, Melobesiaceæ, Rhodomelaceæ.

Division BRYOGAMÆ.

Class MUSCINEÆ.

Cohort *Muscineæ*.

Order **Hepaticæ**; Fam. Anthocerotaceæ, Ricciaceæ, Targioniaceæ, Monocleaceæ, Marchantiaceæ, Jungermanniaceæ.
Order **Musci**; Fam. Andreæaceæ, Phascaceæ, Sphagnaceæ, Bryaceæ.

Division SCHISTOGAMÆ.

Class PUTERÆ.

Cohort *Puterœ*.

Order **Puteræ**; Fam. Characeæ.

Division PROTHALLOGAMÆ.

Class ISOSPOREÆ.

Cohort *Isosporeæ*.

Order **Filicariæ**; (1) Sub-order Trichosporangiæ; Fam. Hymenophyllaceæ, Polypodiaceæ, Gleicheniaceæ, Osmundaceæ.
(2) Sub-order Phyllosporangiæ; Fam. Marattiaceæ.
(3) Sub-order Ophioeporangiæ; Fam. Ophioglossaceæ.
Order **Calamariæ**; Fam. Equisetaceæ.
Order **Conariæ**; Fam. Lycopodiaceæ.

Class HETEROSPOREÆ.

Cohort *Heterosporeæ*.

Order **Phyllocarpariæ**; Fam. Selaginaceæ, Isoetaceæ.
Order **Rhizocarpariæ**; Fam. Salviniaceæ, Marsiliaceæ.

Division PHANEROGAMÆ.

Class GYNOSPERMÆ.

Cohort *Coniferæ*.

Order **Strobilifloræ**; Fam. Cycadaceæ, Pinaceæ, Taxaceæ, Gnetaceæ.
Order **Conifloræ**; Fam. Welwitschiaceæ.

Class ANTHOSPERMÆ.

Cohort *Dendroicæ*.

Order **Spermifloræ**; Fam. Viscaceæ, Loranthaceæ.

Class ANGIOSPERMÆ.

Sub-class DICOTYLEDONES.

Cohort *Dimorphanthæ*.

Orders Julifloræ, Globifloræ, Clavifloræ, Urticifloræ, Euphorbifloræ, Begonifloræ.

Cohort *Monochlamydanthæ*.

Orders Nudifloræ, Involucrifloræ, Ranifloræ, Cactifloræ, Cytinifloræ, Daphnifloræ.

Cohort *Dichlamydanthæ*.

Orders Cirrifloræ, Myrtifloræ, Lythrifloræ, Rosifloræ, Tiliifloræ, Crucifloræ, Rutifloræ, Ericifloræ, Primulifloræ, Celastrifloræ, Umbellifloræ, Oleifloræ, Campanifloræ, Asterifloræ, Coroliifloræ.

Sub-class MONOCOTYLEDONES.

Cohort *Centranthæ*.

Order Centrifloræ.

Cohort *Hydranthæ*.

Orders Fluviifloræ, Alismifloræ.

Cohort *Lirianthæ*.

Orders Glumifloræ, Spadicifloræ, Liliifloræ, Labellifloræ.